



# **DEEP SEA ELECTRONICS**

## **DSEA106 MKII Configuration Suite**

### **PC Software Manual**

**Document Number: 057-283**

Author: Fady Atallah





**Deep Sea Electronics Ltd.**

Highfield House  
Hunmanby  
North Yorkshire  
YO14 0PH  
England

**Sales Tel:** +44 (0) 1723 890099

**E-mail:** [sales@deepseaelectronics.com](mailto:sales@deepseaelectronics.com)

**Website:** [www.deepseaelectronics.com](http://www.deepseaelectronics.com)

**DSEA106 MKII Configuration Suite PC Software Manual**

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**Amendments List**


Issue	Comments
1	Initial release
2	Updated for Droop CT settings
3	Update for V2.1 including additional PID in commissioning.
4	Updated for new Idle Frequency Detection.
5	Corrections in the manual

Typeface: The typeface used in this document is *Arial*. Care must be taken not to mistake the upper case letter I with the numeral 1. The numeral 1 has a top serif to avoid this confusion.

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## 1 INTRODUCTION

 **WARNING!: LIVE PARTS exist within the AVR. To avoid damage to persons and/or property, only qualified personnel having full understanding of the application must install and configure the product.**

This document details the use of the *DSE Configuration Suite PC Software* with the DSEA106 MKII AVR, which is part of the DSEGenset® range of products.

The manual forms part of the product and should be kept for the entire life of the product. If the product is passed or supplied to another party, ensure that this document is passed to them for reference purposes.

This is not a *controlled document*. DSE do not automatically inform on updates. Any future updates of this document are included on the DSE website at [www.deepseaelectronics.com](http://www.deepseaelectronics.com)




The *DSE Configuration Suite PC Software* allows the DSEA106 MKII AVR to be connected to a PC via the DSE815 Configuration Interface. Once connected, the software allows easy, controlled access to various operating parameters within the AVR which can then be viewed and edited as required.

The *DSE Configuration Suite PC Software* must only be used by competent, qualified personnel, as changes to the operation of the module may have safety implications for the generating set to which it is fitted.

The information contained in this manual must be read in conjunction with the information contained in the appropriate module documentation. This manual only details which settings are available and how they may be used. Separate manuals deal with the operation of the individual module and its ancillaries, refer to section entitled *Bibliography* elsewhere in this document for further information.

## 1.1 CLARIFICATION OF NOTIFICATION

Clarification of notation used within this publication.

 <b>NOTE:</b>	Highlights an essential element of a procedure to ensure correctness.
 <b>CAUTION!</b>	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.
 <b>WARNING!</b>	Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.

## 1.2 GLOSSARY OF TERMS

Term	Description
DSEA000 DSEAxXX	All AVR's in the DSEAxXX range.
DSEA106 MKII	DSEA106 MKII AVR
AVR	Automatic Voltage Regulator An electronic device designed to automatically maintain a constant voltage output level of a generator.
CT	Current Transformer An electrical device that takes a large AC current and scales it down by a fixed ratio to a smaller current.
BMS	Building Management System A digital/computer based control system for a building's infrastructure.
HMI	Human Machine Interface A device that provides a control and visualisation interface between a human and a process or machine.
IEEE	Institute of Electrical and Electronics Engineers
LED	Light Emitting Diode
PMG	Permanent Magnet Generator A Generator that controls the alternator excitation voltage via a Permanent Magnet type alternator (typically attached the shaft of the main alternator).

### 1.3 BIBLIOGRAPHY

This document refers to and is referred to by the following DSE publications which is obtained from the DSE website [www.deepseaelectronics.com](http://www.deepseaelectronics.com) or by contacting DSE technical support: [support@deepseaelectronics.com](mailto:support@deepseaelectronics.com).

#### 1.3.1 INSTALLATION INSTRUCTIONS

Installation instructions are supplied with the product in the box and are intended as a 'quick start' guide only.

DSE Part	Description
053-226	DSEA106 MKII Installation Instructions Sheet

#### 1.3.2 MANUALS

Product manuals are obtained from the DSE website: [www.deepseaelectronics.com](http://www.deepseaelectronics.com) or by contacting DSE technical support: [support@deepseaelectronics.com](mailto:support@deepseaelectronics.com).

DSE Part	Description
057-151	DSE Configuration Suite PC Software Installation & Operation Manual
057-269	DSEA106 MKII Operator Manual

#### 1.3.3 TRAINING GUIDES

Training guides are provided as 'hand-out' sheets on specific subjects during training sessions and contain specific information regarding to that subject.

DSE Part	Description
056-001	Four Steps To Synchronising
056-005	Using CTs With DSE Products
056-026	kVA, kW, kvar and Power Factor
056-069	Firmware Update

#### 1.3.4 THIRD PARTY DOCUMENTS

The following third party documents are also referred to:

Reference	Description
ISBN 1-55937-879-4	IEEE Std C37.2-1996 IEEE Standard Electrical Power System Device Function Numbers and Contact Designations. Institute of Electrical and Electronics Engineers Inc
ISBN 0-7506-1147-2	Diesel generator handbook. L.L.J. Mahon
ISBN 0-9625949-3-8	On-Site Power Generation. EGSA Education Committee.

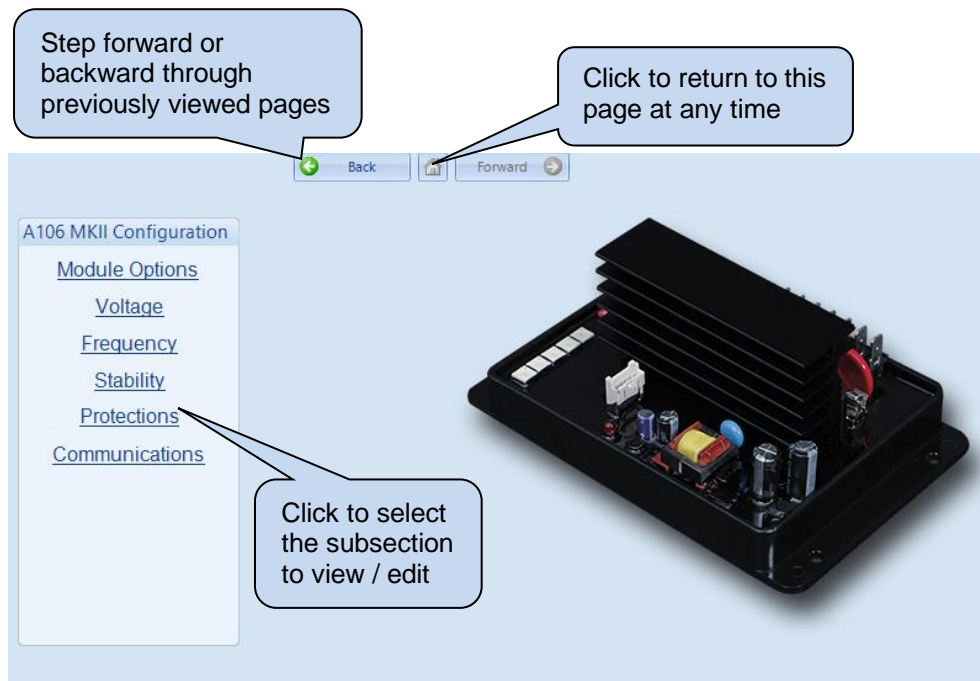
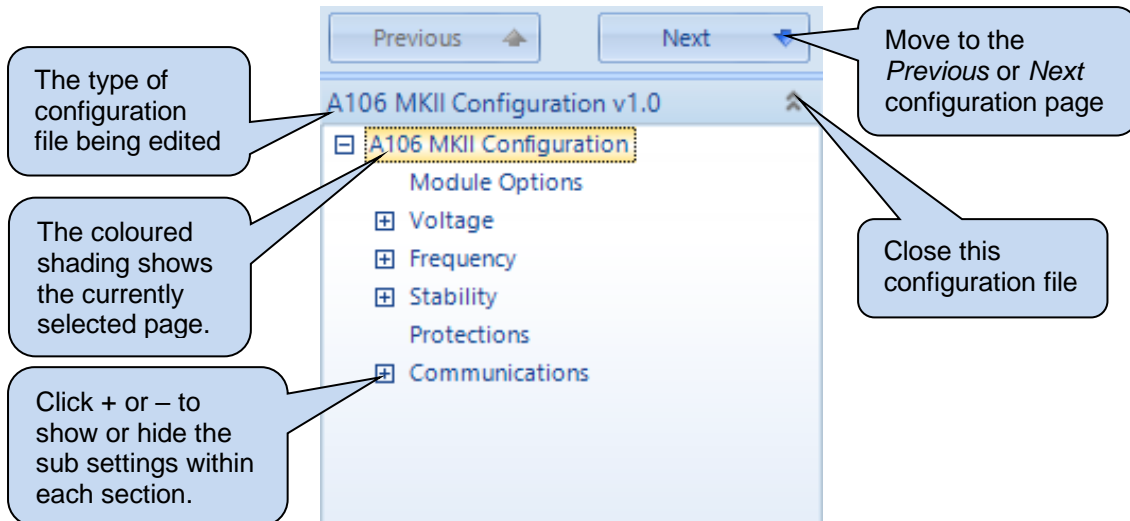
### 1.4 INSTALLATION AND USING THE DSE CONFIGURATION SUITE SOFTWARE

For information in regards to instating and using the DSE Configuration Suite Software please refer to DSE publication: **057-151 DSE Configuration Suite PC Software Installation & Operation Manual** which is found on our website: [www.deepseaelectronics.com](http://www.deepseaelectronics.com)

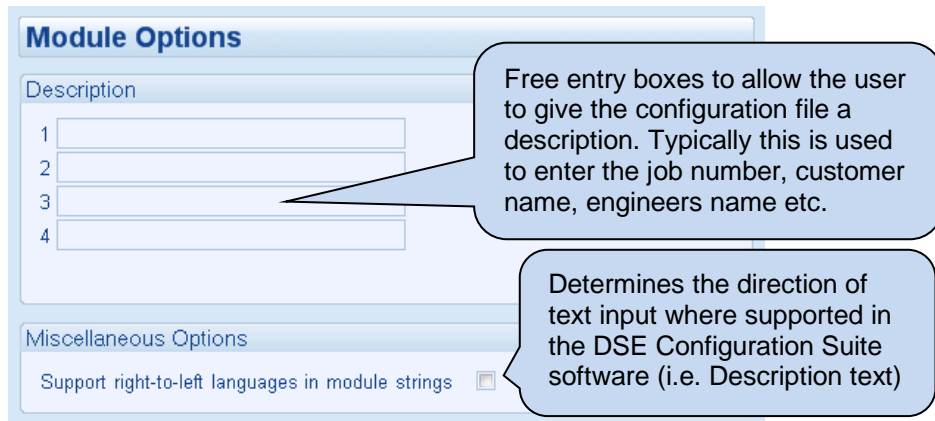
## 2 EDITING THE CONFIGURATION

This menu allows module configuration, to change protection levels, system timers and parameter settings to suit a particular application.

### 2.1 SCREEN LAYOUT



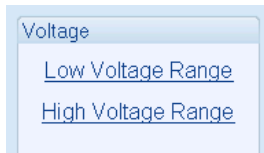
## 2.2 MODULE OPTIONS



## 2.3 VOLTAGE

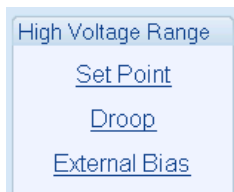
**NOTE:** The voltage range is selected by the DIP switches on the AVR. For further details, refer to DSE Publication: *057-269 DSEA106 MKII Operators Manual*.

The *Voltage* section is subdivided into smaller sections. Select the required section with the mouse.



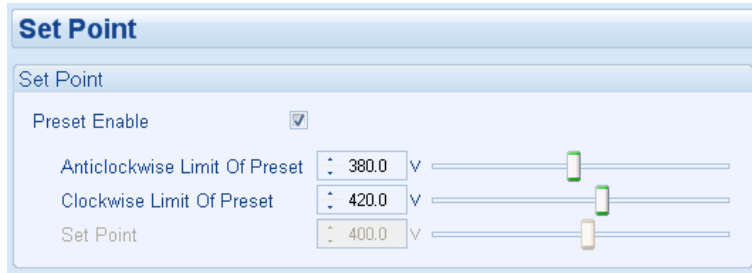
### 2.3.1 LOW / HIGH VOLTAGE RANGE

The *Voltage Range* section is subdivided into smaller sections. Select the required section with the mouse.





2.3.1.1 SET POINT



Parameter	Description
Preset Enable	<p><input type="checkbox"/> = The <i>Voltage Set Point</i> potentiometer is disabled and the voltage output of the alternator is determined by the <i>Set Point</i> parameter in the configuration.</p> <p><input checked="" type="checkbox"/> = The <i>Voltage Set Point</i> potentiometer is enabled and the voltage output of the alternator is determined by the <i>Voltage Set Point</i> potentiometer on the AVR.</p>
Anticlockwise Limit Of Preset	Set the minimum voltage adjustment allowed by the <i>Voltage Set Point</i> potentiometer
Clockwise Limit Of Preset	Set the maximum voltage adjustment allowed by the <i>Voltage Set Point</i> potentiometer
Set Point	When the <i>Preset Enable</i> option is disabled, this determines the voltage output of the alternator.

2.3.1.2 DROOP

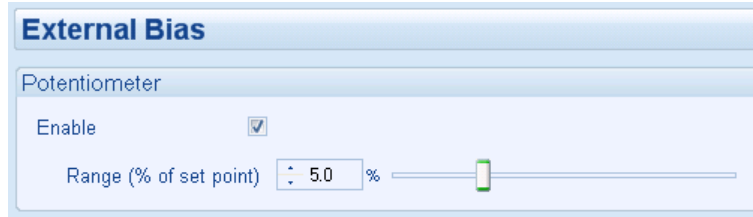
**NOTE:** For further details and examples on how to set the droop function, refer to DSE Publication: *057-269 DSEA106 MKII Operators Manual*.

The screenshot shows the 'Droop' configuration window. It includes several adjustable parameters: 'Preset Enable' (checkbox), 'Clockwise Limit Of Preset' (5.0%), 'Droop (% of set point)' (0.0%), 'Droop CT AC System' (3 Phase, 4 Wire), 'Offset Angle' (90 degrees), and 'Full Load Current' (5,000 A). Below these is a wiring diagram showing a three-phase system with phases L1, L2, and L3. A callout box points to the diagram with the text: 'Refer to DSE Publication: 057-269 DSEA106 MKII Operators Manual for the relevant topology's wiring diagram.'

Parameter	Description
Preset Enable	<input type="checkbox"/> = The <i>Droop</i> potentiometer is disabled. The droop percentage is determined by the <i>Droop</i> parameter in the configuration. <input checked="" type="checkbox"/> = The <i>Droop</i> potentiometer is enabled. The droop is determined by the <i>Droop</i> potentiometer on the AVR.
Clockwise Limit Of Preset	Set the maximum droop adjustment allowed by the <i>Droop</i> potentiometer
Droop (% of Set Point)	Set the droop amount as a percentage of the <i>Voltage Set Point</i>
Droop CT AC System	<div style="border: 1px solid black; padding: 5px;"> <p><b>NOTE:</b> When <b>User Configured</b> is selected the <b>Offset Angle</b> must be manually configured, the <b>Droop CT</b> must be located on <b>L1</b> and connected to the AVR as recommended in the <b>Wiring Diagram</b> detailed in the DSE Publication: <i>057-269 DSEA106 MKII Operators Manual</i>.</p> </div> <p>Select the correct AC wiring system of the voltage sensing, this provides the correct droop CT offset angle automatically.                      The options are:  <b>User Configured</b>  <b>3 Phase, 3 Wire</b>  <b>3 Phase, 4 Wire</b>  <b>3 Phase, 4 Wire Delta L1-N-L2</b>  <b>Single Phase, 2 Wire</b>  <b>Single Phase, 3 Wire L1 – L2</b></p>
Offset Angle	Set the phase angle between the voltage sensing and droop CT reading
Full Load Current	Set the full load current of the Droop CT secondary

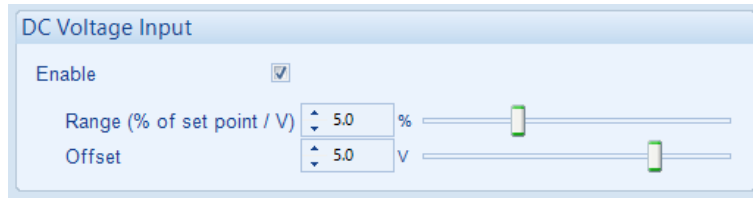
### 2.3.1.3 EXTERNAL BIAS

#### Potentiometer



Parameter	Description
Enable	<input type="checkbox"/> = The <i>Remote Potentiometer</i> input is disabled <input checked="" type="checkbox"/> = The <i>Remote Potentiometer</i> input is enabled, allowing the voltage biasing via a 5 kΩ potentiometer
Range (% of Set Point)	Set the range of voltage bias via the <i>Remote Potentiometer</i> as a percentage of the <i>Voltage Set Point</i>  Example: When this is set to 5.0%, the maximum voltage adjustment via the potentiometer for a nominal voltage 230 V, has a range between 218.5 V and 241.5 V

#### DC Voltage Input

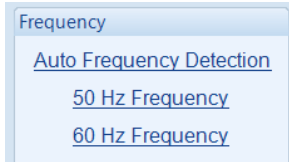


Parameter	Description
Enable	<input type="checkbox"/> = The <i>DC Voltage</i> input is disabled <input checked="" type="checkbox"/> = The <i>DC Voltage</i> input is enabled, allowing the voltage biasing via a -10 V to 10 V DC Voltage signal
Range (% of Set Point)	Set the range of voltage bias via the <i>DC Voltage Input</i> as a percentage of the <i>Set Point per Voltage</i> .  Example: When the <i>Range</i> is set to 5.0% and the <i>Offset</i> is set to 0.0 V, the AVR's adjustment range is $\pm 50\%$ ( $5\% \times \pm 10$ ) of the Set Point. For a nominal voltage of 230 V, has a range between 115 V and 345 V
Offset	This is the DC Voltage to instruct running at the <i>Set Point</i> . It provides an offset to the voltage biasing input. Useful when the output voltage range of the external synchroniser/load matcher is smaller than the full voltage biasing range of the AVR.

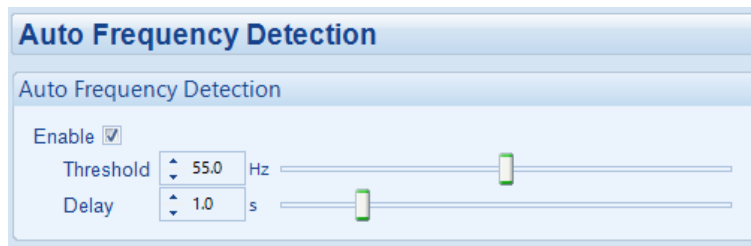
## 2.4 FREQUENCY

**NOTE:** The operating frequency is selected by the DIP Switches on the AVR. For further details, refer to DSE Publication: *057-269 DSEA106 MKII Operators Manual*.

The *Frequency* section is subdivided into smaller sections. Select the required section with the mouse.



### 2.4.1 AUTO FREQUENCY DETECTION



Parameter	Description
Enable	<input type="checkbox"/> = The AVR operates on the selected frequency via the DIP switches. <input checked="" type="checkbox"/> = At startup, when the frequency exceeds the <i>Threshold</i> level for the duration of the <i>Delay</i> time, the AVR switches to 60 Hz frequency mode.
Threshold	Set the threshold frequency level above which the AVR switches between 50 Hz and 60 Hz mode.
Delay	Set the time delay before the AVR switches frequencies.

2.4.2 50 HZ / 60 HZ FREQUENCY

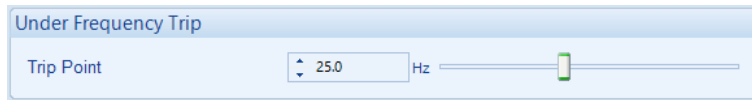
**Under-Frequency Roll-Off (UFRO)**

**NOTE:** For further details on the operation of UFRO, refer to DSE Publication: 057-269 *DSEA106 MKII Operators Manual*.



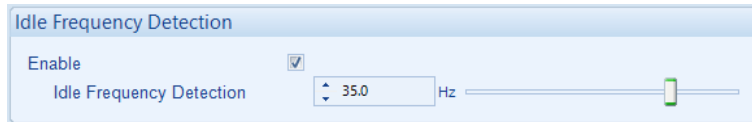
Parameter	Description
Preset Enable	<input type="checkbox"/> = The <i>UFRO Potentiometer</i> is disabled; the <i>Knee Point</i> setting in the configuration is enabled <input checked="" type="checkbox"/> = The <i>UFRO Potentiometer</i> is enabled; the <i>Knee Point</i> setting in the configuration is disabled
Anticlockwise Limit of Preset	Set the low limit for the UFRO potentiometer on the module.
Knee Point	Set the <i>Knee Point</i> for the UFRO protection. This the frequency setpoint at which the UFRO protection starts.
Instantaneous Mode	<input type="checkbox"/> = The <i>UFRO Instantaneous Mode</i> is disabled; the <i>UFRO</i> ramping down protection starts at the knee point <input checked="" type="checkbox"/> = When the frequency drops below the <i>Knee Point</i> setting, the voltage output is instantly dropped to the configured <i>Step</i> level. Any further drop in frequency would result in a decrease of voltage output based on the configured <i>Ramp Rate</i> .
Ramp Rate (%/Hz)	Set the <i>Ramp Rate</i> for the UFRO protection, this is the percentage of <i>Set Point Voltage</i> decreased with every 1 Hz drop when the frequency drops below the configured <i>Knee Point</i> or the setpoint determined by the UFRO potentiometer
Dwell Time	Set the time delay before the AVR excitation starts to ramp up when a UFRO protection has occurred.
Ramp Up Rate After Dwell (%/s)	Set the rate of voltage ramp up after the <i>Dwell Time</i> expires. This is the percentage of <i>Set Point Voltage</i> increased every 1 s.

**Under Frequency Trip**



Parameter	Description
Under Frequency Trip Point	Set the frequency setpoint at which the AVR excitation is disabled.

**Idle Frequency Detection**

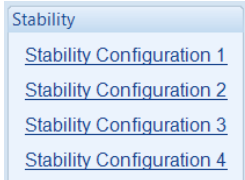


Parameter	Description
Idle Frequency Detection	<p><input type="checkbox"/> = The <i>Idle Frequency Detection</i> is disabled; the <i>Soft Start Ramps</i> as soon as the AVR is powered.</p> <p><input checked="" type="checkbox"/> = The <i>Idle Frequency Detection</i> is enabled; the <i>Soft Start Ramp</i> begins once the generator's frequency exceeds the configured level.</p>

## 2.5 STABILITY

**NOTE:** The stability range is selected by the DIP switches on the AVR. For further details, refer to DSE Publication: *057-269 DSEA106 MKII Operators Manual*.

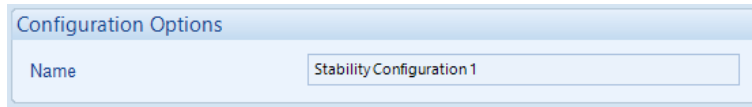
The *Stability* section is subdivided into sub sections.  
 Select the required section with the mouse.  
 This allows the configuration of different stability settings for different sizes of alternators.



### 2.5.1 STABILITY CONFIGURATION 1 TO 4

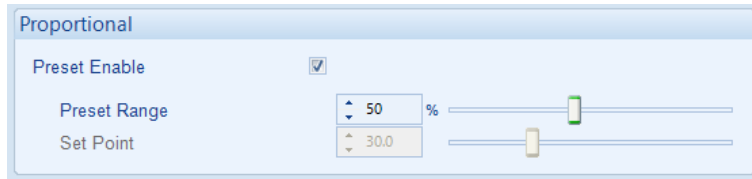
**NOTE:** For further details on stability settings, refer to DSE Publication: *057-269 DSEA106 MKII Operators Manual*.

#### Configuration Options



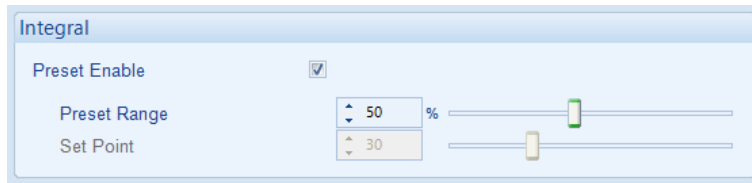
Parameter	Description
Name	Give a custom name to identify this stability configuration

#### Proportional



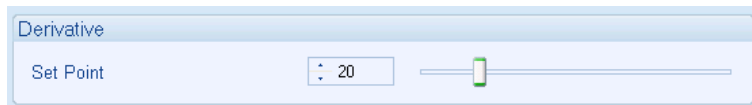
Parameter	Description
Preset Enable	<input type="checkbox"/> = The <i>Proportional Potentiometer</i> on the AVR is disabled; the <i>Set Point</i> setting in the configuration is enabled. The set point is also adjustable using the SCADA   Commissioning page whilst the generator is running. <input checked="" type="checkbox"/> = The <i>Proportional Potentiometer</i> on the AVR is enabled; the <i>Set Point</i> setting in the configuration is disabled
Preset Range	Set the range of the <i>Proportional Gain</i> potentiometer on the module.
Set Point	When the potentiometer is disabled, this parameter fixes the <i>Proportional Gain</i> setting in the AVR

**Integral**



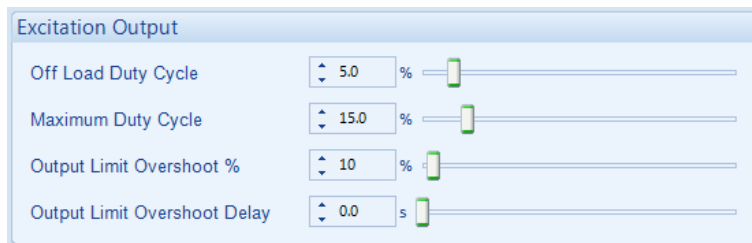
Parameter	Description
Preset Enable	<input type="checkbox"/> = The <i>Integral Potentiometer</i> on the AVR is disabled; the <i>Set Point</i> setting in the configuration is enabled. The set point is also adjustable whilst the generator is running using the SCADA   Commissioning page. <input checked="" type="checkbox"/> = The <i>Integral Potentiometer</i> on the AVR is enabled; the <i>Set Point</i> setting in the configuration is disabled
Preset Range	Set the range of the <i>Integral Gain</i> potentiometer on the module.
Set Point	When the potentiometer is disabled, this parameter fixes the <i>Integral Gain</i> setting in the AVR

**Derivative**



Parameter	Description
Set Point	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p><b>NOTE:</b> For further details on the gain settings, refer to DSE Publication: <i>057-269 DSEA106 MKII Operators Manual</i>.</p> </div> <p>Set the <i>Derivative Gain</i> parameter in the AVR. The set point is also adjustable whilst the generator is running using the SCADA   Commissioning page.</p>

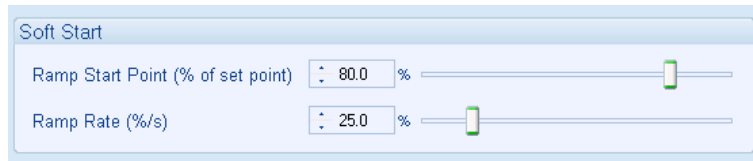
**Excitation Output**



Parameter	Description
Off Load Duty Cycle	Set the initial output duty cycle when starting. This is useful to ensure a fast voltage build-up upon starting.
Maximum Duty Cycle	Set the maximum output duty cycle.
Output Limit Overshoot %	The Output Limit Overshoot allows the <i>Duty Cycle</i> to exceed the <i>Maximum Duty Cycle</i> setting by the <i>Output Limit Overshoot %</i> of the <i>Maximum Duty Cycle</i> level for the duration of <i>Output Limit Overshoot Delay</i> .



**Soft Start**



The image shows a configuration window titled "Soft Start". It contains two parameters, each with a numerical input field and a corresponding slider. The first parameter is "Ramp Start Point (% of set point)" with a value of 80.0%. The second parameter is "Ramp Rate (%/s)" with a value of 25.0%.

Parameter	Description
Ramp Start Point (% of Set Point)	Set the start point for the voltage build-up ramp. This is configured in percentage of the set point voltage. This is useful to allow a quick voltage build-up when starting the set.
Ramp Rate (%/s)	Set the rate for the voltage build-up ramp in percentage of set point voltage per second.

## 2.6 PROTECTIONS

### Timers

Timers

Start-up Fail Delay 3.0 s

Loss of Feedback Delay 0.5 s

Parameter	Description
Start-up Fail Delay	Set the time delay for the <i>Start-up Fail</i> alarm when the module does not measure the auxiliary voltage upon starting.
Loss of Feedback Delay	Set the time delay for the <i>Loss Of Feedback Delay</i> alarm when the module sees a sudden loss of feedback voltage.

### Over Excitation

Over Excitation

Over Excite Trip 50.0 V

Over Excite Delay 1.0 s

Parameter	Description
Over Excite Trip	Set the <i>Over Excite Trip</i> level. The <i>Over Excite Trip</i> alarm activates when the excitation voltage exceeds the configured setting for longer than the <i>Over Excite Trip</i> delay.
Over Excite Delay	Set the time delay for the <i>Over Excite Trip</i> alarm.

### External Potentiometer

External Potentiometer

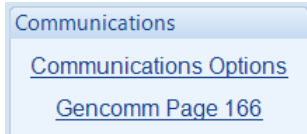
Enable Open Circuit Alarm

Parameter	Description
Enable Open Circuit Alarm	<input type="checkbox"/> = The External Potentiometer Open Circuit Alarm is disabled. <input checked="" type="checkbox"/> = The <i>External Potentiometer Open Circuit Alarm</i> is enabled. This allows detection of open circuit when the external potentiometer is disconnected.

## 2.7 COMMUNICATIONS

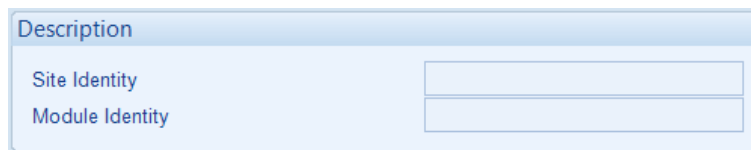
The DSE815 Configuration Interface communication port is provided to give a simple means of connection between a PC and the controller.

The *Communications* page is subdivided into smaller sections. Select the required section with the mouse.



### 2.7.1 COMMUNICATIONS OPTIONS

#### Description



Parameter	Description
Site Identity / Module Identity	Free text entries to identify the module. These texts are displayed on the SCADA screen when the module is connected to the PC.

### 2.7.2 GENCOMM PAGE 166

Configurable Gencomm pages are available to allow the user to create personal collections of data in subsequent registers to minimise the number of modbus reads required by the master, and hence speed up data collection.

All configurable Gencomm registers are 32-bit unsigned format.

Gencomm Page 166					
Register	Value	Register	Value	Register	Value
0-1	<Not Used>	64-65	<Not Used>	128-129	<Not Used>
2-3	<Not Used>	66-67	<Not Used>	130-131	<Not Used>
4-5	<Not Used>	68-69	<Not Used>	132-133	<Not Used>
6-7	<Not Used>	70-71	<Not Used>	134-135	<Not Used>
8-9	<Not Used>	72-73	<Not Used>	136-137	<Not Used>
10-11	<Not Used>	74-75	<Not Used>	138-139	<Not Used>
12-13	<Not Used>	76-77	<Not Used>	140-141	<Not Used>

#### Example of Gencomm page configuration:

Register	Value
0-1	Frequency
2-3	Voltage
4-5	General

The register address is obtained from the formula:  
 $register\_address = page\_number * 256 + register\_offset$

To read the *Frequency* from the above register, the Modbus master device needs to read the data in two registers and then combine the data from the Most Significant 16-Bit register and the Least Significant 16-Bit register.

MSB address in Decimal =  $(166 * 256) + 0 = 42496$

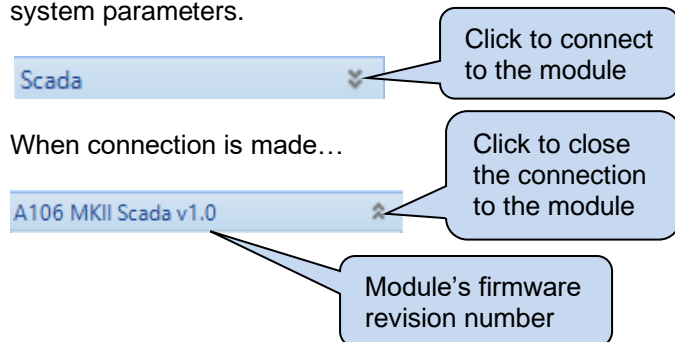
LSB address in Decimal =  $(166 * 256) + 1 = 42497$

### 3 SCADA

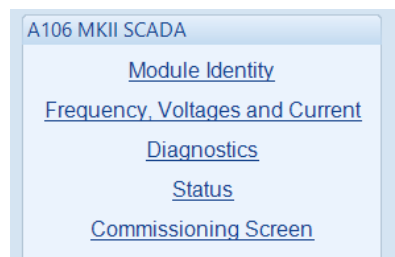
**NOTE:** The DSE815 RS485 Configuration Interface and the configuration port on the module are designed to be used for configuration and diagnostics, not for monitoring.

SCADA stands for **S**upervisory **C**ontrol **A**nd **D**ata **A**cquisition and is provided both as a service tool and also as a means of monitoring and control.

As a service tool, the SCADA pages is to check the operation of the module as well as checking the system parameters.



The SCADA page is subdivided into smaller sections. Select the required section with the mouse.



### 3.1 MODULE IDENTITY

Shows the module's current settings for *Site Identity* and *Module Identity*.

<b>Module Identity</b>
Site Identity
Deep Sea Electronics PLC
Module Identity
DSEA106

### 3.2 FREQUENCY, VOLTAGES AND CURRENT

Shows the modules measurements of the frequency, voltages and current.

Frequency, Voltages and Current	
Frequency	0.0 Hz
Feedback Voltage	0.0 V
Droop Current	0.00 A    0.0 °
Excitation Voltage	0.0 V
Auxiliary Voltage	0.0 V

### 3.3 DIAGNOSTICS

**NOTE:** For further details on *Dip Switch Adjustment*, refer to *DSE Publication: 057-269 DSEA106 MKII Operators Manual*.

#### Diagnostics






##### Switch Settings

	Open / Closed	
1 Voltage	<input checked="" type="checkbox"/> ON	Low Voltage Range
2 Frequency	<input checked="" type="checkbox"/> ON	50Hz
3 Stability 1	<input checked="" type="checkbox"/> ON	Stability Configuration 1
4 Stability 2	<input checked="" type="checkbox"/> ON	
5 Auto Frequency		Disabled

##### External Control

Potentiometer      Voltage

##### Set Points

Voltage	Droop	UFRO Knee	Proportional	Integral
				
231.1 V	0.0 %	42.9 Hz		
		Derivative 20.0		

##### Output Duty Cycle

100.00 %

##### Internal Supply Voltage

2.3 V

Shows the position of the selection switches on the module.

Shows if the pots are enabled and their current position



### 3.4 STATUS

Shows the module's current status.

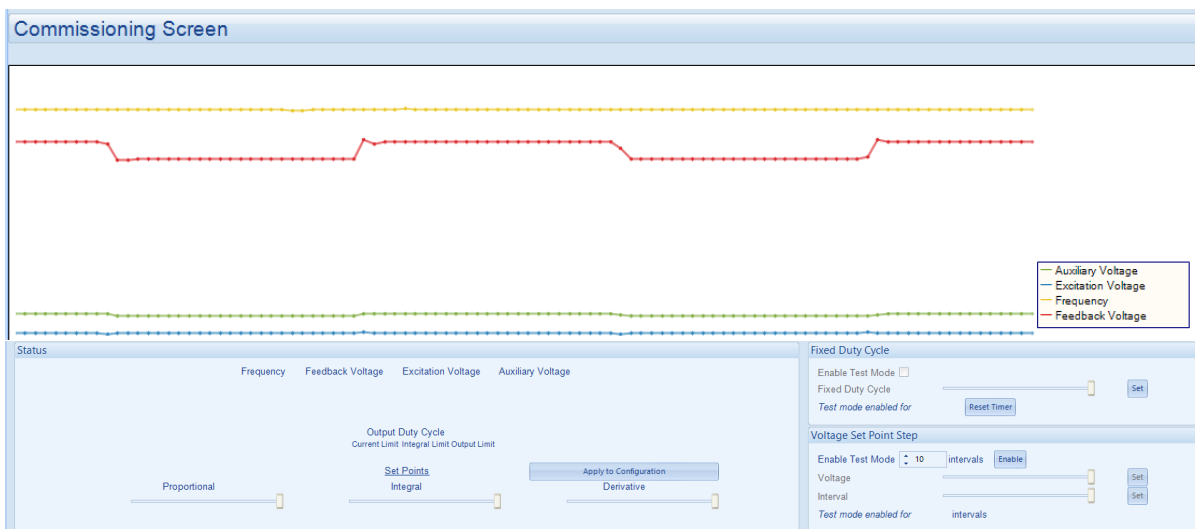
Status	
Supervisor State	Running
Software Version	1.0.14
Bootloader Version	1.0.7
Module ID	11FADF95D
Alarm	<input type="button" value="Reset"/>

The module automatically resets the active alarms when the generator is stopped and the module is powered off. This allows resetting alarms when the DSE815 Configuration Interface is connected and the module remains powered up.

### 3.5 COMMISSIONING SCREENS

**NOTE:** For further details on the setup procedure, refer to *DSE Publication: 057-269 DSEA106 MKII Operators Manual*.

Shows a trace of the module's parameters to help with commissioning and adjusting the signal response.



Parameter	Description
Gain (P) Stability (I) Derivative (D)	<p><b>NOTE:</b> Only enabled when <i>Preset Enabled</i> is unticked. For further details see section entitled <i>Stability</i> defined elsewhere in this manual.</p> <p>The setting for the Gain (P), Stability (I) and Derivative (D) of the control loop for the AVR.</p>
Apply to Configuration	Writes the Gain (P), Stability (I) and Derivative (D) of the control loop to the modules configuration file.

#### 3.5.1 STATUS

Parameter	Description
Frequency	The generator frequency.
Feedback Voltage	The generator voltage.
Excitation Voltage	The alternator exciter voltage.
Auxiliary Voltage	The Auxiliary winding voltage.
Supervisor State	The state of the generator (Running, Idle or Stopped)
Output Duty Cycle	This value indicates the <i>Off Load Duty Cycle</i> it must be configured to when the generator is running with no load.
Proportional	Indicates the <i>Proportional</i> Set Point.
Integral	Indicates the <i>Integral</i> Set Point.
Derivative	Indicates the <i>Derivative</i> Set Point.

### 3.5.2 FIXED DUTY CYCLE

Parameter	Description
Enable Test Mode	<p><input type="checkbox"/> = The Test mode is disabled, the AVR operates according to the preset values.</p> <p><input checked="" type="checkbox"/> = The Test mode is enabled. With this mode the AVR no longer tries to adjust to the <i>Set Point</i>. The AVR changes the <i>Output Duty Cycle</i> to the <i>Fixed Duty Cycle</i> percentage. This causes the excitation to increase or decrease depending if the <i>Fixed Duty Cycle</i> % level is greater or smaller than the <i>Off Load Duty Cycle</i>. This provides a load bank simulation to calibrate the <i>Set Points</i>.</p>
Fixed Duty Cycle %	The percentage the excitation output's <i>Duty Cycle</i> is forced to when <i>Test Mode</i> is enabled. The higher the <i>Fixed Duty Cycle</i> % the greater the excitation, the lower the <i>Fixed Duty Cycle</i> % the lower the excitation.

### 3.5.3 VOLTAGE SET POINT STEP

This feature allows the user to simulate a load being applied to the generator. It changes the target of the generator voltage adjustment to check the overshoot and time response.

Parameter	Description
Voltage Set Point Step Enable Test Mode intervals	This interval is the repetition number to vary the generator's output voltage up and down between the <i>Set Point</i> and the increased <i>Voltage</i> % levels.
Voltage %	The amount of Voltage to be changed in percentage during the <i>Test Mode</i> .
Interval	The delay time to increase the excitation output after each interval.

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